

United States Patent

Sobel et al.

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[54] IMAGE-DISPLAY DEVICES
COMPRISING PARTICLE LIGHT
MODULATORS WITH STORAGE

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[58] Field of Search340/324 R, 174 R, 174 EA, 174.1 M; 350/160, 267, 269

[56] References Cited

UNITED STATES PATENTS

3,292,171	12/1966	Wilson.....	350/267
2,875,537	3/1959	Murphy.....	340/324 R
3,322,482	5/1967	Harmon.....	350/267
1,835,612	12/1931	Pearson.....	350/267

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[57] ABSTRACT

An image-display panel is composed of horizontal rows and

vertical columns of illumination-control cells, each of which includes anisometric particles of suspended magnetic material that normally obstruct light but become oriented to pass light in response to the application of a magnetic field. Individually associated with different cells are a plurality of magnetic storage elements that effect control of the application of the fields to the cells. A like plurality of magnetic-field-producing devices are individually associated with respective cells and storage elements. In response to vertical synchronizing signals, conditioning pulses are selectively applied to respective rows of the field-producing devices in order to create in the corresponding storage elements respective field components of magnitudes insufficient to orient the particles in the associated cells for light control. In response to horizontal synchronizing signals, control pulses are selectively applied to respective columns of the field-producing devices in order to create, in the corresponding storage elements, respective field components of magnitudes sufficient, together with the respective field components created in response to the conditioning pulses, to establish in the respective cells resultant fields sufficient to orient the affected particles for light control. At the same time, the amplitude of the conditioning or control pulses is modulated by video signals so that the total magnitude of each of the resultant fields is proportional to the instantaneous video level. The storage elements thereafter serve to maintain orientation of the particles until, finally, in response to synchronizing signals, the storage elements are periodically de-activated in time-correspondence with successive intervals of the video information. In one extension of the basic disclosure, a manually movable magnet is employed to write additional information into the display.

21 Claims, 15 Drawing Figures

